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NSRDEC Project Officer:

Flexible Photovoltaics:

Mission Power from the Sun

Steven Tucker
Senior Engineer, EE
COMM 508-233-6962
DSN 256-6962

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Report Documentation Page				Form Approved OMB No. 0704-0188	
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1. REPORT DATE NOV 2009		2. REPORT TYPE		3. DATES COVERED 00-00-2009 to 00-00-2009	
4. TITLE AND SUBTITLE Flexible Photovoltaics: Mission Power from the Sun				5a. CONTRACT NUMBER	
				5b. GRANT NUMBER	
				5c. PROGRAM ELEMENT NUMBER	
6. AUTHOR(S)				5d. PROJECT NUMBER	
				5e. TASK NUMBER	
				5f. WORK UNIT NUMBER	
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Army Research, Development and Engineering Command (RDECOM), Army Natick Soldier RD&E Center, Shelter Technology, Engineering & Fabrication Directorate, Natick, MA, 01760				8. PERFORMING ORGANIZATION REPORT NUMBER	
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)				10. SPONSOR/MONITOR'S ACRONYM(S)	
				11. SPONSOR/MONITOR'S REPORT NUMBER(S)	
12. DISTRIBUTION/AVAILABILITY STATEMENT Approved for public release; distribution unlimited					
13. SUPPLEMENTARY NOTES 6th Bi-Annual DOD JOCOTAS Meeting with Rigid & Soft Wall Shelter Industry & Indoor & Outdoor Exhibition, 2-4 Nov 2009, Panama City Beach, FL					
14. ABSTRACT					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT Same as Report (SAR)	18. NUMBER OF PAGES 13	19a. NAME OF RESPONSIBLE PERSON
a. REPORT unclassified	b. ABSTRACT unclassified	c. THIS PAGE unclassified			



Flexible Photovoltaics – Why?



Travel Lighter, Stay Longer!

Problem: Current power sources are heavy, expendable and detectable, not directly integratable into Warrior Systems, and do not have sufficient density for extended missions.

Known – Photovoltaics (PV) convert “free” light energy into electricity with no noise, moving parts, fuel consumption or pollutant emissions.

Less known – PV technology has changed significantly over recent years... that technology now allows PV's to be flexible and lightweight!



Photo courtesy DOE/NREL



Today's PV's can provide many benefits to the military.....

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Shelter Integrated Flexible PV Power Shade



Application:

- Solar shade w/ integral PV power, reduces solar load 80% – 90%
- Small version provides 1 KW of PV power
 - Designed to fit over: MGPTS small, 16' TEMPER
- Medium version provides 2 KW of PV power
 - Designed to fit over MGPTS medium, 24' TEMPER
- Modular expandability

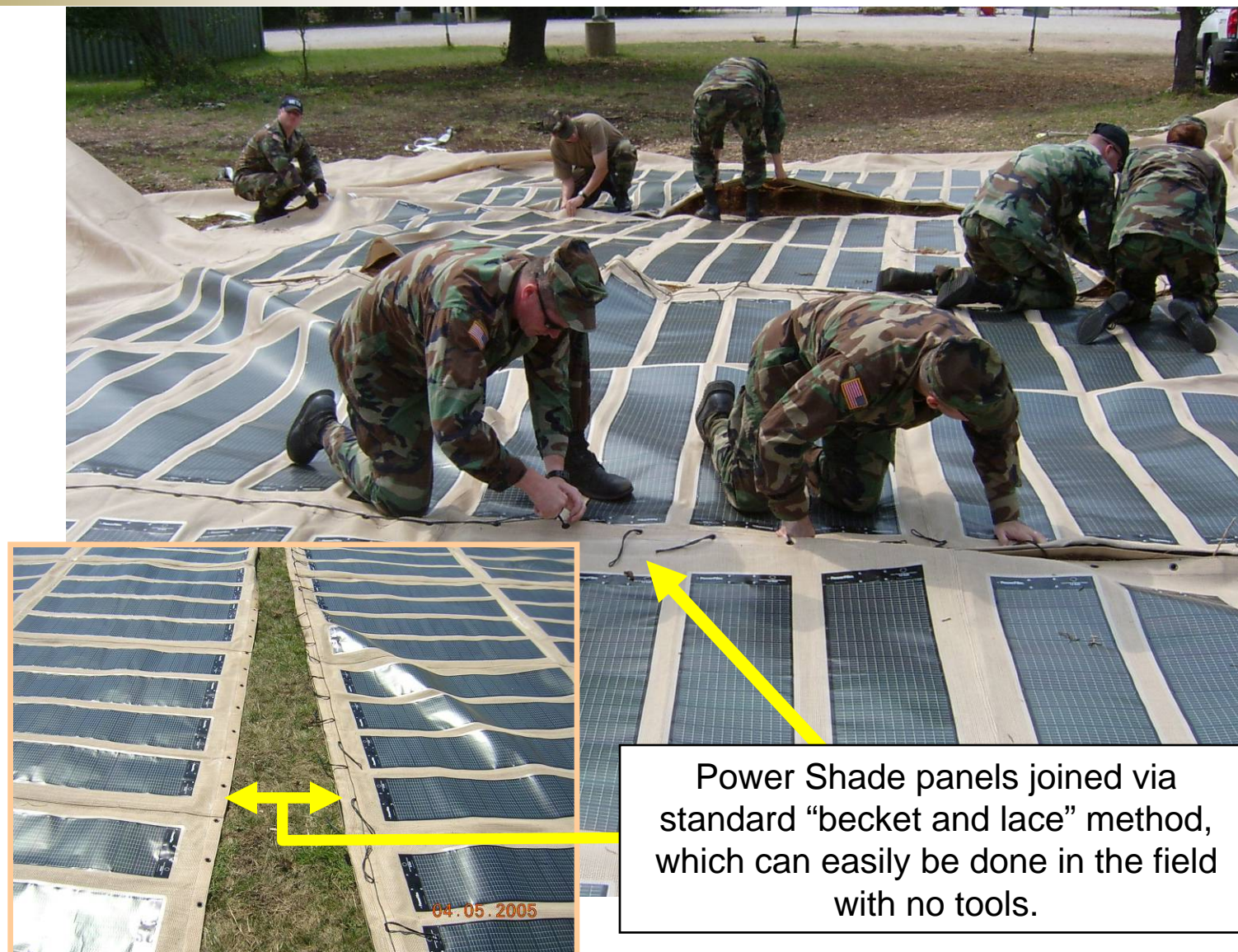


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Power Shade – Easy field assembly



Power Shade panels joined via
standard “becket and lace” method,
which can easily be done in the field
with no tools.

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Shelter Integrated Flexible PV 2 kW Power Shade



Give them one prior supervised set-up, and 20 minutes later...



...these Soldiers are enjoying the reality of shade AND silent electrical power with no logistical fuel tail!

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Application:

- TEMPER PV fly is a "drop-in" replacement for existing tent fly
 - Provides ~750W of power
- QUADrant is ¼ of a TEMPER fly
 - Provides ~ 200W of power
 - Modular expandability, flexible ground or frame mounted use.

TEMPER Fly



QUADrant



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TEMPER fly and QUADrant - Large impact applications



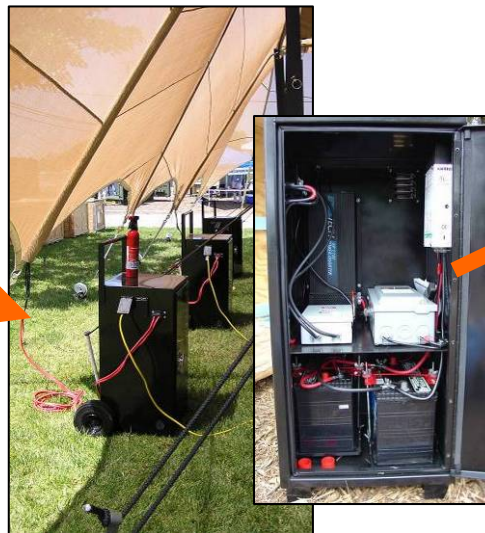
TEMPER tent complexes with large surface areas offer the military an opportunity for real fuel savings and less generator maintenance by replacing the standard TEMPER fly with a PV integrated TEMPER fly, or QUADrant units!



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Energy collection and storage w/ DC to AC conversion in one unit



4-man portable unit
(capacity ~1 KW)

- Reduction of weight and cube with preference to COTS components
- Modular unit to match PV capability – 2KW PowerShade uses 3 BOS units.
- Simplified hook-up for ease of use with integrated DC Buss for power sharing
- Rugged. Passed testing at Aberdeen Proving Ground (APG) – FY09.



Portable power in the field

- 5, 10, 20, 30 and 60 watt units
- 12VDC output (24VDC available)
- Easily deployed, just unfold and use!
- Compact and lightweight (6oz for 5w unit)
- Daisy chain units together for higher power

Application:

- Versatile PV power supply.... Just roll out anywhere for instant power
- Multiple sizes to match the need - .3, .6, and 1.2 Amp units
- Stores in it's own pouch
- Rolls tight.. Rolls to under 5" diameter for even the largest unit
- Roll-able units with Desert tan and Olive drab substrate available



Technical Specifications:

	Operating Voltage (V)	Operating Current (Amps)	Weight (lbs./kg)	Rolled Dimensions (in./mm)	Unrolled Dimensions (in./mm)
PowerFilm® R15-300	15.4	.3	.6 .29	11.5x4x3.75 292x101x92	11.5 x 21 292 x 531
PowerFilm® R15-600	15.4	.6	1 .46	11.5x4.25x4.25 292x108x108	11.5 x 38 292 x 972
PowerFilm® R15-1200	15.4	1.2	1.9 .88	12x4.25x4.5 305x108x114	12 x 73 305 x 1858

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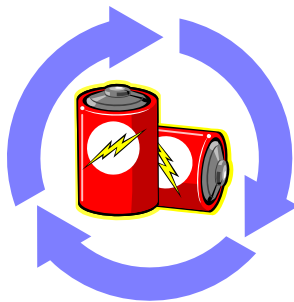


Flexible PV Charging Solution: AA battery charger



Specifications:

- Capacity:
 - Two (2) or Four (4) AA batteries
 - Charges both NiMH and NiCAD chemistries
- Weight (w/o batteries): ~ 3.4 oz
 - Less than the weight of four (4) AA batteries!
- Approx time to charge
 - Full Sun: ~ 4 hours
 - Partly cloudy: ~ 6 - 8 hours
 - Overcast: ~ 16 hours



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Flexible PV Charging Solution: BB2590 / BB390 battery charger



- 3rd iteration design shown
 - New smaller package & electronics have >90% charging efficiency!
 - Intuitive design with LED indicator for optimal solar panel orientation
- OFIG field evaluation completed in FY09.

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- Questions?
- Comments?
- Suggestions?

Soldier input always welcome!

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